

WHAT IS CLAIMED IS:

1. A compressible fluid supply path structure,
said compressible fluid supply path structure being of
a convergent-divergent nozzle type,

5 said compressible fluid supply path structure
comprising:

 a fluid inlet into which a compressible fluid is
made to flow;

10 a throat portion for controlling said compressible
fluid to a speed less than a sound speed;

 a fluid outlet of which said compressible fluid is
made to flow out; and

15 a circulation system for circulating said
compressible fluid flowing out of said fluid outlet,
into said fluid inlet.

2. The compressible fluid supply path structure
according to Claim 1, wherein a ratio of a pressure at
said fluid inlet to a pressure at said fluid outlet is
20 not less than a ratio of critical pressures.

3. The compressible fluid supply path structure
according to Claim 1, which is shaped so as to decrease
disturbance caused by said compressible fluid.
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4. The compressible fluid supply path structure
according to Claim 1, which is a structure without an

inflection point.

5. The compressible fluid supply path structure according to Claim 1, further comprising:

5 at least one pressure correcting means for correcting a pressure at said fluid inlet or at said fluid outlet.

10 6. The compressible fluid supply path structure according to Claim 5, wherein the correction for the pressure by said pressure correcting means is carried out near said fluid inlet.

15 7. The compressible fluid supply path structure according to Claim 1, further comprising:

at least one temperature correcting means for correcting a temperature at said fluid inlet or at said fluid outlet.

20 8. The compressible fluid supply path structure according to Claim 7, wherein said temperature correcting means has a cooling function and said cooling is effected near said fluid outlet.

25 9. The compressible fluid supply path structure according to Claim 1, further comprising:

vertical width adjusting means for adjusting a

vertical width of said throat portion.

10. The compressible fluid supply path structure according to Claim 1, which is symmetric with respect
5 to said throat portion at the center.

11. A compressible fluid supply path structure comprising:

10 a fluid inlet into which a compressible fluid is made to flow;

a predetermined portion for controlling said compressible fluid to a speed less than a sound speed;

a fluid outlet of which said compressible fluid is made to flow out;

15 at least one temperature correcting means for correcting a temperature at said fluid inlet or at said fluid outlet; and

a circulation system for circulating said compressible fluid flowing out of said fluid outlet,
20 into said fluid inlet.

12. The compressible fluid supply path structure according to Claim 11, wherein said temperature correcting means has a cooling function and said
25 cooling is effected near said fluid outlet.

13. A compressible fluid supply method

comprising:

a step of making a compressible fluid flow into a fluid inlet of a compressible fluid supply path structure of a convergent-divergent nozzle type;

5 a step of controlling said compressible fluid to a speed less than a sound speed, at a throat portion of said compressible fluid supply path structure;

10 a step of making said compressible fluid flow out of a fluid outlet of said compressible fluid supply path structure; and

a circulation step of circulating said compressible fluid flowing out of said fluid outlet, into said fluid inlet by a circulation system.

15 14. The compressible fluid supply method according to Claim 13, wherein said compressible fluid supply path structure is arranged so that a ratio of a pressure at said fluid inlet to a pressure at said fluid outlet is not less than a ratio of critical
20 pressures.

15. A compressible fluid supply method comprising:

25 a step of making a compressible fluid flow into a fluid inlet of a compressible fluid supply path structure;

a step of controlling said compressible fluid to a

speed less than a sound speed, at a predetermined portion of said compressible fluid supply path structure;

5 a step of making said compressible fluid flow out of a fluid outlet of said compressible fluid supply path structure;

10 a step of correcting at least one of temperatures at said fluid inlet and at said fluid outlet by temperature correcting means of said compressible fluid supply path structure; and

a circulation step of circulating said compressible fluid flowing out of said fluid outlet, into said fluid inlet by a circulation system.

15 16. The compressible fluid supply method according to Claim 15, wherein said temperature correcting means has a cooling function and said cooling is effected near said fluid outlet.

20 17. A laser oscillating apparatus comprising:
a gas supply path structure for supplying a laser gas, said gas supply path structure being of a convergent-divergent nozzle type,

25 said gas supply path structure comprising:
a fluid inlet into which said laser gas is made to flow;

a throat portion for controlling said laser gas to

a speed less than a sound speed; and

a fluid outlet of which said laser gas is made to flow out.

5 18. The laser oscillating apparatus according to Claim 17, which comprises:

 said gas supply path structure for supplying said laser gas,

 said gas supply path structure further comprising:

10 a circulation system for circulating said laser gas flowing out of said fluid outlet, into said fluid inlet.

15 19. The laser oscillating apparatus according to Claim 17, which comprises:

 said gas supply path structure for supplying said laser gas,

20 said gas supply path structure being arranged so that a ratio of a pressure at said fluid inlet to a pressure at said fluid outlet is not less than a ratio of critical pressures.

25 20. The laser oscillating apparatus according to Claim 17, wherein said laser gas is an excimer laser gas which is a mixture of F_2 gas with at least one inert gas selected from Kr, Ar, Ne, and He.

21. The laser oscillating apparatus according to Claim 17, which comprises:

said gas supply path structure for supplying said laser gas,

5 said gas supply path structure being a structure without an inflection point.

22. The laser oscillating apparatus according to Claim 17, which comprises:

10 said gas supply path structure for supplying said laser gas,

said gas supply path structure further comprising:

15 at least one pressure correcting means for correcting a pressure at said fluid inlet or at said fluid outlet.

23. The laser oscillating apparatus according to Claim 17, which comprises:

20 said gas supply path structure for supplying said laser gas,

said gas supply path structure further comprising:

25 at least one temperature correcting means for correcting a temperature at said fluid inlet or at said fluid outlet.

24. The laser oscillating apparatus according to Claim 23, which comprises:

said gas supply path structure for supplying said laser gas,

wherein said temperature correcting means has a cooling function and wherein said cooling is effected near said fluid outlet.

25. The laser oscillating apparatus according to Claim 17, which comprises:

said gas supply path structure for supplying said laser gas,

said gas supply path structure further comprising: vertical width adjusting means for adjusting a vertical width of said throat portion.

26. The laser oscillating apparatus according to Claim 18, which comprises:

said gas supply path structure for supplying said laser gas,

wherein said circulation system is comprised of at least one bellows pump.

27. The laser oscillating apparatus according to Claim 18, which comprises:

said gas supply path structure for supplying said laser gas,

wherein said circulation system is comprised of at least one circulating pump.

28. The laser oscillating apparatus according to Claim 18, which comprises:

said gas supply path structure for supplying said laser gas,

5 wherein said circulation system is comprised of at least one blower.

29. The laser oscillating apparatus according to Claim 18, which comprises:

10 said gas supply path structure for supplying said laser gas,

wherein said circulation system is comprised of at least one Sirocco fan.

15 30. A laser oscillating apparatus comprising:

a gas supply path structure group for supplying a laser gas, said gas supply path structure group being of a shape of gas supply path structures of a convergent-divergent nozzle type connected in series,

20 said gas supply path structure group comprising:

a fluid inlet into which said laser gas is made to flow;

a central part for controlling said laser gas to a speed greater than a sound speed; and

25 a fluid outlet of which said laser gas is made to flow out.

31. The laser oscillating apparatus according to Claim 30, which comprises:

said gas supply path structure group for supplying said laser gas,

5 said gas supply path structure group further comprising:

a circulation system for circulating said laser gas flowing out of said fluid outlet, into said fluid inlet.

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32. The laser oscillating apparatus according to Claim 30, wherein said laser gas is an excimer laser gas which is a mixture of F_2 gas with at least one inert gas selected from Kr, Ar, Ne, and He.

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33. The laser oscillating apparatus according to Claim 30, which comprises:

said gas supply path structure group for supplying said laser gas,

20 said gas supply path structure group being a structure without an inflection point.

34. The laser oscillating apparatus according to Claim 30, which comprises:

25 said gas supply path structure group for supplying said laser gas,

said gas supply path structure group further

comprising:

at least one pressure correcting means for
correcting a pressure at said fluid inlet or at said
fluid outlet.

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35. The laser oscillating apparatus according to
Claim 30, which comprises:

said gas supply path structure group for supplying
said laser gas,

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said gas supply path structure group further
comprising:

at least one temperature correcting means for
correcting a temperature at said fluid inlet or at said
fluid outlet.

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36. The laser oscillating apparatus according to
Claim 30, which comprises:

said gas supply path structure group for supplying
said laser gas,

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said gas supply path structure group further
comprising:

vertical width adjusting means for adjusting a
vertical width of said central portion.

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37. The laser oscillating apparatus according to
Claim 31, which comprises:

said gas supply path structure group for supplying

said laser gas,

wherein said circulation system is comprised of at least one bellows pump.

5 38. The laser oscillating apparatus according to Claim 31, which comprises:

said gas supply path structure group for supplying said laser gas,

10 wherein said circulation system is comprised of at least one circulating pump.

39. The laser oscillating apparatus according to Claim 31, which comprises:

15 said gas supply path structure group for supplying said laser gas,

wherein said circulation system is comprised of at least one blower.

20 40. The laser oscillating apparatus according to Claim 31, which comprises:

said gas supply path structure group for supplying said laser gas,

wherein said circulation system is comprised of at least one Sirocco fan.

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41. An exposure apparatus comprising:

a laser oscillating apparatus, said laser

oscillating apparatus generating illumination light,

said laser oscillating apparatus comprising a gas supply path structure for supplying a laser gas, said gas supply path structure being of a convergent-

5 divergent nozzle type,

said gas supply path structure comprising:

a fluid inlet into which said laser gas is made to flow;

10 a throat portion for controlling said laser gas to a speed less than a sound speed; and

a fluid outlet of which said laser gas is made to flow out,

a first optical system for radiating said illumination light from said laser oscillating apparatus onto a reticle in which a predetermined pattern is formed; and

15 a second optical system for radiating said illumination light having passed through said reticle, onto a surface to be irradiated.

42. An exposure apparatus comprising:

a laser oscillating apparatus, said laser oscillating apparatus generating illumination light,

25 said laser oscillating apparatus comprising a gas supply path structure group for supplying a laser gas, said gas supply path structure group being of a shape

comprised of gas supply path structures of a
convergent-divergent nozzle type connected in series,

said gas supply path structure group
comprising:

5 a fluid inlet into which said laser gas
is made to flow;

a central part for controlling said
laser gas to a speed greater than a sound speed;
and

10 a fluid outlet of which said laser gas
is made to flow out,

a first optical system for radiating said
illumination light from said laser oscillating
apparatus onto a reticle in which a predetermined
15 pattern is formed; and

a second optical system for radiating said
illumination light having passed through said reticle,
onto a surface to be irradiated.

20 43. A method for producing a device, said method
comprising:

a step of coating a surface to be irradiated, with
a photosensitive material;

a step of effecting exposure of a predetermined
25 pattern in said surface to be irradiated, coated with
said photosensitive material, using the exposure
apparatus as set forth in Claim 41 or 42; and

a step of developing said photosensitive material on said surface after the exposure.

44. The method according to Claim 43, wherein
5 said surface to be irradiated is a wafer surface and a
semiconductor element is formed on said wafer surface.

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